

TRL 701

Major 2023

Duration: 2 hrs

Max. Marks 35

Name _____

Reg. No. _____

1. Give short answers. (2)

i. Difference between mode specific model and mode abstract model

ii. Difference between MNL model and nested logit model

iii. Difference between Gravity model and Fratar model.

iv. Difference between System optimization and User Equilibrium formulation for network.

2. Base Year Trip distribution is given in the following table:

I / J	1	2	3	4
1	0	20	30	15
2	20	0	10	40
3	30	10	0	35
4	15	40	35	0

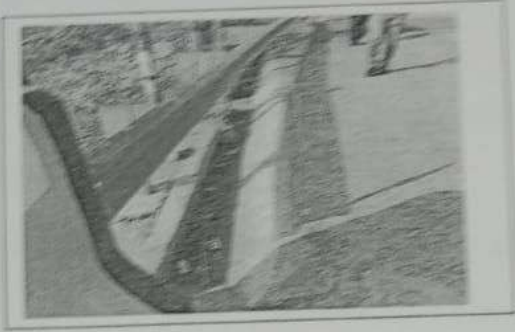
Growth Factor:

Zone I	G
1	2
2	2
3	3
4	1

Find the target year trip distribution by using Fratar model. Discuss the adjustment factors calculated after first iteration. (2+ 1)

3. Suggest at least 1 remedial measure for the problem identified in the following photographs:

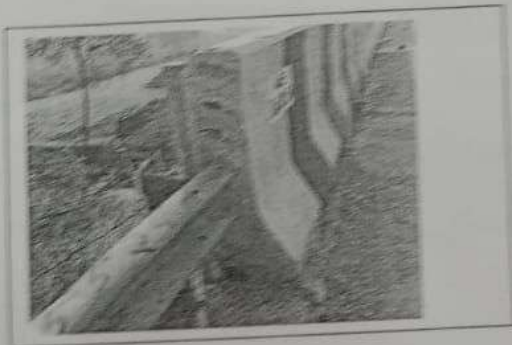
(2)



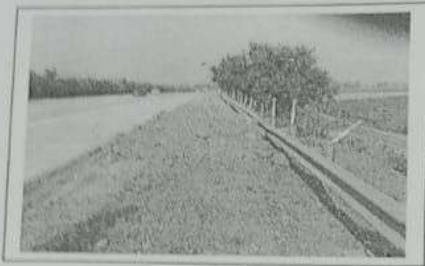
a.



b.



c.



d.

4. (2)

i. IRC SP 99 (Traffic Calming) recommends repeated bar markings on two lane road before approaching a habitation, why: Mark the most appropriate answer:

- a. reduce speeds from 80km/h to 40km/h
- b. Caution drivers of cross traffic
- c. Warn drivers of approaching habitation(40/km h zone), and gradually reduce speed

ii. What is the appropriate speed limit for an urban arterial road?

- a. 10km/h
- b. 50km/h
- c. 80km/h

iii. What is the appropriate speed limit for undivided SH passing through a habitation?

- a. 10km/h
- b. 40km/h
- c. 80km/h

iv. What is the appropriate speed limit near school zones?

- a. 10km/h
- b. 20 km/h
- c. 80km/h

5. Mark the correct answer. (2)

i. High medians can be given in high speed road to avoid single vehicle crashes (True/False)

ii. W- Beam barriers are best for roads with heavy vehicle traffic.

(True/ False)

iii. Cable barriers are always better than any other type of barriers.

(True/ False)

iv. 27% of fatal crashes occur at curves in a road, these can be reduced by:

- a. Posting speed limit signs before the curve
- b. Increasing the clear zone, flattening the slope or widening the shoulders, installation of bar makers
- c. Installing " accident spot" sign

6. (4)

i. Which of the following factors affects a vehicle's handling?

- a) Weight distribution
- b) Engine displacement
- c) Tire pressure
- d) Fuel efficiency

ii. What is the purpose of the suspension system in a vehicle?

- a) To improve fuel efficiency
- b) To provide a smooth ride
- c) To increase the vehicle's top speed
- d) To reduce engine noise

iii. What is oversteer in vehicle dynamics?

- a) When the rear wheels lose traction, and the car spins out

- b) When the front wheels lose traction and the car understeers
- c) When the vehicle's weight shifts to the front during braking
- d) When the vehicle's weight shifts to the rear during acceleration

iv. What is the difference between understeer and oversteer?

- a) Understeer is when the rear wheels lose traction and the car spins out, while oversteer is when the front wheels lose traction and the car slides.
- b) Understeer is when the front wheels lose traction and the car slides, while oversteer is when the rear wheels lose traction and the car spins out.
- c) Understeer and oversteer are the same thing.
- d) Understeer and oversteer only occur in high-performance vehicles.

v. What is the purpose of a differential in a vehicle?

- a) To transfer power from the engine to the wheels
- b) To provide a smooth ride
- c) To reduce tire wear
- d) To allow the wheels to turn at different speeds while cornering

vi. . Which of the following factors affects a vehicle's stopping distance?

- a) Tire tread depth
- b) Fuel type
- c) Air conditioning settings
- d) Vehicle colour

vii.. What is the purpose of anti-lock brakes (ABS)?

- a) To reduce engine noise
- b) To prevent the wheels from locking up during braking

c) To provide more power to the engine during acceleration

d) To improve fuel efficiency

viii. What is the purpose of traction control in a vehicle?

a) To prevent the wheels from spinning during acceleration

b) To reduce engine noise

c) To provide a smoother ride

d) To improve fuel efficiency

7. (3)

i. Mark the correct answer

a. No evidence that mechanical CPR devices improve survival. (True/False)

b. Trauma care from time of injury until arrival at hospital is Pre-hospital care. (True/False)

c. Mechanical CPR devices improve survival. They improve neurological outcome. (True/False)

d. Transfer by helicopter ambulances improved the estimated odds of survival. True/False)

ii.

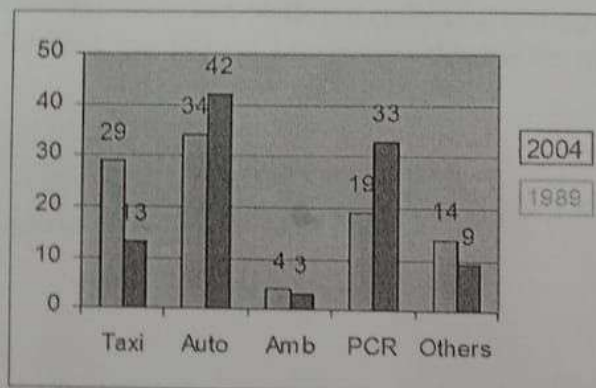


Figure shows mode of transport used to reach the hospital by road traffic victims. How has the trend changed from 1989 to 2004? Identify two changes.

a.

b.

8. Mark the correct answer (2)

- a. Motorcycle helmets greatly reduce the impact forces on the head and stresses in the head.(true/False)
- b. Helmet works till 8.5m/s or 30.6 km/hr .(true/False)
- c. A chin strap has a design function that secures the head and helmet in order to prevent it from rolling off during and impact or series of impact .(true/False)
- d. When the helmet hits the road or a curb, the outer shell stops gradually. (true/False)

9. (2)

- i. List two vehicle design features that protect pedestrians at the time of crash.

- ii. List 2 reasons why wearing of a safety belt is necessary for an effective use of an airbag.

iii. Young children should not be carried on lap in front seat, why?

10. (2)

i. Dual objectives of traffic signals are _____ and _____

ii. At a high pedestrian location requiring a WALK (P_w) time of 10 seconds, what should be the total pedestrian time ($P_w + P_c$) if the road is 22 m wide and walking speed is considered as 1.1 m/sec?

iii. If the saturation headway is 1.8 seconds, what is the saturation flow rate in vehicles per hour of green per lane (vphgpl)?

iv. If a traffic signal has two phases, a cycle length of 80 seconds, total lost time of 5 sec/phase, and a saturation headway of 2.0 sec/veh. What is the maximum allowable sum of critical lane flows?

13. Write short answers: (2)

i. Deterministic disaggregate and stochastic disaggregate choice models.

ii. Production and attraction trip matrix and origin and destination trip matrix.

iii. Impact of improving a transport facility in the short run and in the long run.

iv. Difference between mode specific and mode abstract mode choice models.

14. A city can be divided into two zones – inner zone and suburban zone. Every year 40% of the inner zone population moves to suburban zone and 15% population of the suburban zone moves to inner zone. Find the steady state proportion of the population of the two zones of the city. (3)

15. (2)

i. Which of the following is not a possible "Best Practice" under current laws & jurisprudence in India?

- a. Incorporate detailed design information such as the installation of safe and accessible crossing facilities for pedestrians into all new highway construction and reconstruction projects
- b. Impose criminal liability on transportation planners and engineers in case of fatal accidents due to poor design and/or execution of highway projects
- c. Require continuing professional education for all agency engineers and consultants
- d. Create stand-alone bicycle and pedestrian facility manuals that provide detailed design information addressing on-street bicycle facilities, fully accessible sidewalks, crosswalks, and shared use paths, and other improvements

ii. What was the constitutional argument the Supreme Court of India used in its ruling in *M C Mehta v. Union of India* [1997 (8) SCC 770] to equate the Right to be safe on the roads with the right to life.

16. Road crash data on Agr–Lucknow expressway shows a large proportion of single vehicle crashes hitting medians and crash barriers. Police report notes "driver slept" in more than 50% of these crashes. Apply safe systems (list the important principles) and identify suitable remedial measures to prevent these crashes. (4)